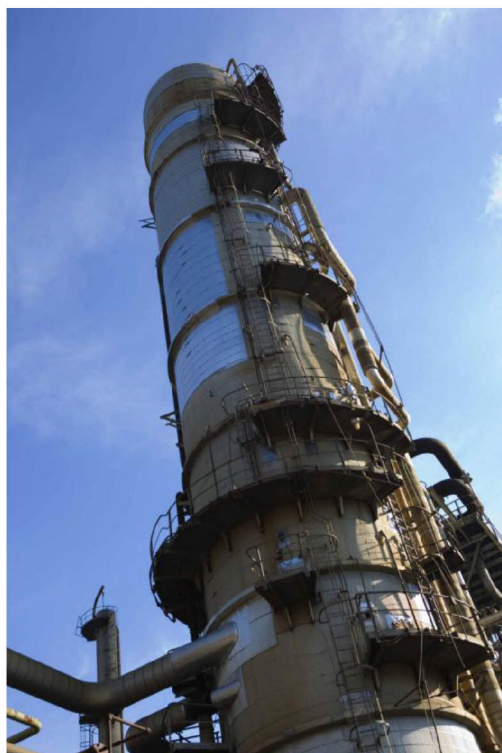


Process Variables



Senior Analyst and Inspector Training Crude Units

Process Variables to Control or Monitor Crude Distillation Units



Process variables are indicated as “C” for those which are to be controlled, and “M” for those to be monitored

Variable to be Measured	To Do	Significance
Sulfur Content of Desalted Crude	M	High Temperature H ₂ S Corrosion Increases as Sulfur Content Rises
Total Acid Number of Desalted Crude	M	TAN Above 0.3 Suggests That Naphthenic Acid Corrosion May Occur
Salt Content of Desalted Crude	M	High Salt Content Indicates Poor Desalter Operation and Increased Corrosion in Atmospheric Overhead System
Skin Point Temperatures of Tubes in Atmospheric Furnace	C	Excessive Temperature Increases Tube Corrosion and Probability of Creep Failures
Atmospheric Furnace Transfer Line Temperature	M	Higher Temperature Increases Hot H ₂ S Corrosion of Furnace, Atmospheric Column, and Sidecut Piping and Exchangers
Atmospheric Column Hot Sidecut Temperature	M	Increases May Lead to Attack of Sidecut Piping and Exchangers — Steel Shell of Atmospheric Column May Begin to Corrode Just Above the Termination of Cladding
Atmospheric Column Bottoms Temperature	M	Increases May Accelerate Attack of Bottoms Line if Carbon Steel

Process Variables to Control or Monitor Crude Distillation Units (Cont'd)



Variable to be Measured	To Do	Significance
Atmospheric Column Overhead Vapor Line Temperature	C	Changes Will Have a Vital Effect on Overhead Corrosion Control Program, in Terms of Where or Whether Salt Deposition Occurs — Can Also Affect Required Water Injection Rate if Water is Being Injected
pH of Draw Water From Atmospheric Column Reflux Drum(s)	C	This is an Essential Corrosion Variable and Must Be Controlled Within the Specified Limits
Ammonia Content of Draw Water From Reflux Drum	M	Needed for Ammonia Balance to Determine When Ammonium Chloride May Sublime
Water in Reflux From Atmospheric Overhead Accumulator to Column	M	Increased Water Can Drag Neutralizer to Column and Result in Salt Formation on Top Trays — Also Cause Corrosion if Water Results in Wet Conditions
Wash Water Rate to Incoming Crude	C	Should Be at Least ~2 LV % of Crude to Prevent Dryout, Salt Deposition, and Under-Deposit Corrosion of Preheat Exchanger Tubes
Chloride Content of Draw Water From Atmospheric Column Reflux Drum(s)	C	High Chloride Accelerates Both Corrosion and Salt Deposition — Can Be Controlled by Varying Caustic Injection Rate to Crude Feed Line
Inhibitor Injection Rate to Atmospheric Overhead Vapor Line	C	Too Much Inhibitor Costs Money and Potential Fouling — Too Little May Accelerate Overhead System Corrosion
Water Injection Rate to Atmospheric Overhead Vapor Line (If Water Injection is Used)	C	Must Be 30% Greater Than the Amount Required to Saturate the Vapor and Provide Wetting of Vertical Exchanger Tube Surfaces

Process Variables to Control or Monitor Crude Distillation Units (Cont'd)



Variable to be Measured	To Do	Significance
Oxygen Content of Overhead Injection Water	C	Limit to 50 ppb Maximum to Minimize Corrosion and Scaling
Iron Content of Overhead Injection Water	C	Limit to 1 ppm to Minimize the Formation of Iron Sulfide Scale
Caustic Injection Rate to Crude Feed	C	If Rate is Too Low, Chlorides in Overhead System Will Rise to Potentially Corrosive Levels — If Too High, Caustic SCC and Corrosion Can Occur in Crude Feed Line and Exchangers
Tube Skin Point Temperatures in Vacuum Heater	C	If Too High, Creep or Corrosion Failure of Tubes Can Occur
Vacuum Heater Transfer Line Temperature	M	Increases Will Cause a General Increase in High Temperature H ₂ S Corrosion in Vacuum Column and Sidecut Systems
Total Acid Number of Vacuum Column HGO	M	Naphthenic Acid Corrosion May Occur if TAN Exceeds 1.5 mg/g
Total Acid Number of Vacuum Column LGO	M	Same as Above
Total Acid Number of Atmospheric Gas Oil Streams	M	Same as Above
Vacuum Column Bottoms Temperature	M	Increases May Accelerate Attack of Bottoms Piping and Exchangers

Process Variables to Control or Monitor Crude Distillation Units (Cont'd)



Variable to be Measured	To Do	Significance
Wash Oil Rates	C	Too Low and Vacuum Column Will Coke Up
Water in Reflux From Atmospheric Overhead Accumulator to Column	M	Increased Water Can Drag Neutralizer to Column and Result in Salt Formation on Top Trays – Also Cause Corrosion if Water Results in Wet Conditions